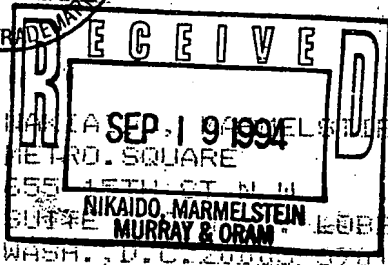


UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office

Address: Box ISSUE FEE  
COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231



D1M1/0916

NIKAI DO, MARMELSTEIN MURRAY & ORAM  
WASHINGTON, D.C. 20004-5701

NOTICE OF ALLOWANCE  
AND ISSUE FEE DUE

JUL 08 1998

GROUP 2100

- ☒ Note attached communication from the Examiner  
☐ This notice is issued in view of applicant's communication filed \_\_\_\_\_

SERIES CODE/SERIAL NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
07/743,383	08/21/91	019	GOUDREAU, G	1109 09/16/94
First Named Applicant	KONNO, JUN-ICHI			

TITLE OF INVENTION: METHOD FOR PRODUCING SEMICONDUCTOR INTEGRATED CIRCUITS AND APPARATUS USED IN SUCH METHOD

ISSUE FEE: December 11, 1994

DRAWINGS: November 16, 1994

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
1 911333	156-665.000	E51	UTILITY	NO	\$1170.00	12/16/94

THE FEE DUE IS THE AMOUNT IN EFFECT AT THIS TIME. IF THE AMOUNT OF THE ISSUE FEE INCREASES PRIOR TO PAYMENT, APPLICANT WILL BE NOTIFIED OF THE BALANCE OF ISSUE FEE DUE.

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT.

PROSECUTION ON THE MERITS IS CLOSED.

THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

**HOW TO RESPOND TO THIS NOTICE:**

- I. Review the SMALL ENTITY Status shown above.  
If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

- A. If the status is changed, pay twice the amount of the FEE DUE shown above and notify the patent and Trademark Office of the change in status, or  
B. If the Status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:

- A. Pay FEE DUE shown above, or  
B. File verified statement of Small Entity Status before, or with, pay of 1/2 the FEE DUE shown above.

DOCKETED BY 10/21

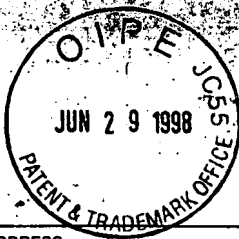
DATE 9/19/94

- II. Part B of this notice should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by charge to deposit account, Part B should be completed and returned. If you are charging the ISSUE FEE to your deposit account, Part C of this notice should also be completed and returned.

- III. All communications regarding this application must give series code (or filing date) and serial number. Please direct all communications prior to issuance to Box ISSUE FEE unless advised to contrary.

**IMPORTANT REMINDER:** Patents Issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

YOUR COPY



PART C—CHARGE TO DEPOSIT ACCOUNT

1. CORRESPONDENCE ADDRESS

DI1M1/0916  
NAKIAIDO, MARCELSTIEN, MURRAY & ORAM  
METRO. SQUARE  
655 15TH ST, N.W.  
SUITE 330-G ST. LOBBY  
WASH., D.C. 20005-5701

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GROUP 2100

SERIES CODE/SERIAL NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
07/743,383	08/21/91	019	GOULBEAU, G	09/14/94
First Named Applicant	KONNO, JUN-ICHI			

TITLE OF INVENTION: METHOD FOR PRODUCING SEMICONDUCTOR INTEGRATED CIRCUITS AND APPARATUS USED IN SUCH METHOD

	ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
1	911333	156-665.000	EXN	UTILITY	NO	\$1170.00	12/16/94

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98 JUL 13 AM 11:05  
GROUP 150

- 2a. The following fees are enclosed:  
☐ Issue Fee ☐ Advanced Order - # of Copies \_\_\_\_\_ (Minimum of 10)
- 2b. The following fees should be changed to:  
DEPOSIT ACCOUNT NUMBER \_\_\_\_\_  
☐ Issue Fee ☐ Advanced Order - # of Copies \_\_\_\_\_ (Minimum of 10)  
☐ Any Deficiencies in Enclosed Fees \_\_\_\_\_

The COMMISSIONER OF PATENTS AND TRADEMARKS is requested to apply the Issue Fee to the application identified above.

(Signature of party in interest of record)

(Date)

NOTE: The Issue Fee will not be accepted from anyone other than applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the Patent and Trademark Office.

TRANSMIT THIS FORM WITH PART B WHEN AUTHORIZING USE OF A DEPOSIT ACCOUNT



UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office  
Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

SERIAL NUMBER	07/743,383	08/21/91	FIRST NAMED APPLICANT	KONNO	J	ATTORNEY DOCKET NO.	911333
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D1M1/0916  
NAKIAIDO, MARCELSTIEN, MURRAY & GRAM  
METRO. SQUARE  
655 15TH ST, N.W.  
SUITE 330-G ST. LOBBY  
WASH., D.C. 20005-5701

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GROUP 2100

GOUDREAU EXAMINER

ART UNIT	PAPER NUMBER
----------	--------------

1109

15

09/16/94

DATE MAILED:

### NOTICE OF ALLOWABILITY

#### PART I.

1. ☒ This communication is responsive to amendment C filed on 6-29-94
2. ☒ All the claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice Of Allowance And Issue Fee Due or other appropriate communication will be sent in due course.
3. ☒ The allowed claims are 1-19
4. ☐ The drawings filed on \_\_\_\_\_ are acceptable.
5. ☒ Acknowledgment is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☒ been received. ☐ not been received. ☐ been filed in parent application Serial No. \_\_\_\_\_, filed on \_\_\_\_\_
6. ☐ Note the attached Examiner's Amendment.
7. ☐ Note the attached Examiner Interview Summary Record, PTOL-413.
8. ☐ Note the attached Examiner's Statement of Reasons for Allowance.
9. ☐ Note the attached NOTICE OF REFERENCES CITED, PTO-892.
10. ☐ Note the attached INFORMATION DISCLOSURE CITATION, PTO-1449.

#### PART II.

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" indicated on this form. Failure to timely comply will result in the ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

1. ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
2. ☒ APPLICANT MUST MAKE THE DRAWING CHANGES INDICATED BELOW IN THE MANNER SET FORTH ON THE REVERSE SIDE OF THIS PAPER.
  - a. ☒ Drawing informalities are indicated on the NOTICE RE PATENT DRAWINGS, PTO-948, attached hereto or to Paper No. 5. CORRECTION IS REQUIRED.
  - b. ☐ The proposed drawing correction filed on \_\_\_\_\_ has been approved by the examiner. CORRECTION IS REQUIRED.
  - c. ☐ Approved drawing corrections are described by the examiner in the attached EXAMINER'S AMENDMENT. CORRECTION IS REQUIRED.
  - d. ☒ Formal drawings are now REQUIRED.

Any response to this letter should include in the upper right hand corner, the following information from the NOTICE OF ALLOWANCE AND ISSUE FEE DUE: ISSUE BATCH NUMBER, DATE OF THE NOTICE OF ALLOWANCE, AND SERIAL NUMBER.

#### Attachments:

- Examiner's Amendment
- Examiner Interview Summary Record, PTOL-413
- Reasons for Allowance
- Notice of References Cited, PTO-892
- Information Disclosure Citation, PTO-1449

- Notice of Informal Application, PTO-152
- Notice re Patent Drawings, PTO-948
- Listing of Bonded Draftsmen
- Other

R. BRUCE BRENNEMAN  
Supervisory Patent Examiner

Art Unit 1109

15. Restriction to one of the following inventions is required under 35 U.S.C. § 121:

I. Claims 1-19, drawn to a dry etching method, classified in Class 156, subclass 643.

II. Claims 20-22, drawn to a dry etching apparatus, classified in Class 156, subclass 345.

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (M.P.E.P. § 806.05(e)). In this case the search required for Group I is not required for Group II.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 C.F.R. § 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a diligently-filed petition under 37 C.F.R. § 1.48(b) and by the fee required under 37 C.F.R. § 1.17(h).

Art Unit 1109

During a telephone conversation with attorney Michael Gilman on March 16, 1994 a provisional election was made with traverse to prosecute the invention of the dry etching claims, claims 1-19. Affirmation of this election must be made by applicant in responding to this Office action. Claims 20-22 are withdrawn from further consideration by the Examiner, 37 C.F.R. § 1.142(b), as being drawn to a non-elected invention.

16. The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Evaluations of the level of ordinary skill in the art requires consideration of such factors as various prior art approaches, types of problems encountered in the art, rapidity with which innovations are made, sophistication of technology involved, educational background of those actively working in the field, commercial success, and failure of others.

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The "person having ordinary skill" in this art has the capability of understanding the scientific and engineering principles applicable to the claimed invention. The evidence of record including the references and/or the admissions are considered to reasonably reflect this level of skill.

17. Claims 1-6 are rejected under 35 U.S.C. § 103 as being unpatentable over Colombo et. al. further in view of (Shinagawa or Fujimura).

Colombo<sup>et. al.</sup> disclose a process for rie etching an Al layer on a semiconductor located beneath a patterned resist layer in a Cl-ambient plasma. The Al layer is formed on a barrier layer on the semiconductor. the barrier layer is comprised of Ti/W or Ti/TiN.

The etched substrate is then passed into an adjacent postetch treatment chamber where the resist layer is removed along with some of the corrosive Cl residues using an O<sub>2</sub> ambient plasma.

*where* This is discussed, and shown on pages 95-99. Colombo et. al. fail, however, to disclose the following aspects of applicant's claimed invention:

- the specific use of a one step combination .  
ashing/neutralization step where the resist and Cl residues are removed from the Al layer using a plasma comprised of H<sub>2</sub>O, and O<sub>2</sub>;

- the specific use of post-etch treatment steps which employ only the neutral species in a plasma by extracting out the

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charged particles prior to contacting the substrate with the metastable plasma; and

- the specific post-etch treatment temperatures claimed by the applicant.

Both Shinagawa, and Fujimura teach that is desirable to ash a resist layer in a metastable plasma comprised of  $O_2$ , and  $H_2O$ . They both employ a grid to remove the charged species from the plasma in order to reduce the amount of radiation damage done to the substrate. They both employ ashing temperatures between 100 and 250°C (in Fujimura). *12-130°C in Shinagawa, and 200°C*

It would have been obvious to one skilled in the art to replace the  $O_2$  ashing/<sup>Cl</sup>-neutralization step taught by Colombo et. al. with the  $O_2/H_2O$  metastable plasma ashing taught by either Shinagawa or Fujimura since this simply represents an alternative, and at least equivalent means for conducting the ashing step taught by Colombo et. al. Further, this step would have inherently neutralized the Cl residues based on the teachings of Colombo et. al. regarding  $O_2$  ambient plasma ashings, and residual Cl residues.

It would have been prima facie obvious to employ any of a variety of ashing temperatures including those claimed by the applicant.

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These are all well known variables in the plasma etching art which are known to effect both the rate and quality of the plasma etching process. Further, the selection of particular values for these variables would simply involve routine experimentation and would not necessitate any undo experimentation which would be indicative of a showing of unexpected results.

18. Claims 7-19 are allowable over the prior art of record.

19. Claims 20-22 are rejected under 35 U.S.C. § 103 as being unpatentable over Tateiwa as applied in paragraph 20 of the previous office action.

20. Claims 1-6 are rejected under 35 U.S.C. § 103 as being unpatentable over Tateiwa further in view of Shinagawa et. al. as applied in paragraph 17 of the previous office action.

21. In order to ensure full consideration of any amendments, affidavits or declarations, or other documents as evidence of patentability, such documents must be submitted in response to this Office action. Submissions after the next Office action, which is intended to be a final action, will be governed by the requirements of 37 C.F.R. § 1.116, which will be strictly enforced.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner George Goudreau whose telephone number is (703) 308-1915.




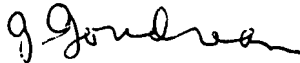
Serial No. 743,383

-7-

Art Unit 1109

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661.

  
**R. BRUCE BRENEMAN**  
Supervisory Patent Examiner  
Art Unit 1109

  
G. Goudreau:mm  
March 24, 1994